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All is not lost for biodiversity

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ABSTRACT

Reports that wildlife declined by more than 50% in recent decades grabbed headlines, but calculating an average global decline is trickier than it might seem. We show that seemingly catastrophic global declines were driven by less than 3% of total populations. We provide a better way to assess biodiversity trends, which reveals both, a need for acute regional conservation and even some improving trends.

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The status of life on Earth is of fundamental scientific interest and societal importance. Based on media headlines, one might believe that we have already lost the majority of wildlife across the world, with bold headlines indicating "Wildlife has declined 68% since 1970" and "Human activity has wiped out 2/3 of world's wildlife since 1970". These global trend estimates are based on the Living Planet Index, which summarizes population estimates for thousands of animal populations contained in the Living Planet Database – one of the most impressive data on wildlife population trends in the world (WWF 2020). Yet, the estimated losses above are not so straightforward to interpret.

An important question is: How did scientists calculate one global trend from thousands of populations? This might seem like a technical detail, but the consequence is profound. The global estimates above were calculated by multiplying growth rates together across all populations. This is the correct approach for a single population. If a population doubles in one year then halves in a second year, these effects will cancel out. If a population becomes extirpated (that is, it goes to zero), growth in other years will not matter (multiplication by zero is zero). However, the interpretation across many populations is less clear.

When calculating growth rates this way across many populations, a few extremely declining populations can dominate estimates for otherwise stable systems (we define a system loosely as a group of species in a region, for instance mammals in Europe). In theory, the total loss of even one population would yield an estimate suggesting the entire system had been wiped out, irrespective of the growth rates of every other population. The real data analysis suggests that removing only the 2.4% most declining populations changes the overall Living Planet Index to approximately zero decline (Leung et al. 2020).

Clearly, it is crucial to distinguish a scenario wherein a few populations are declining extremely but where the majority of populations are stable from one where most populations are declining. Importantly, even a 1.5% yearly decline across 50 years, if experienced by all populations, would result in a 50% decline in overall abundance, and would represent a widespread catastrophe for biodiversity. Identifying the patterns of decline is a difficult problem because populations are naturally changing all the time. Even in stable systems, different populations will grow or decline at different rates and all populations fluctuate over time. Furthermore, different measurements are not carried out in the same way, with many populations only sampled a few times while others have been censused annually for decades. However, it is possible to incorporate all of these factors statistically (for anyone interested, we used what is called a "Bayesian Hierarchical Mixture Model").

Using this approach and separating populations into 57 systems based on the type of vertebrate (e.g., birds, reptiles) and regions in the world, we identified 16 systems that contained groups of populations undergoing extreme declines (Leung et al. 2020). We identified only 8 systems with extreme increases, thus, extreme declines were more common than increases. However, in total, these extreme populations only accounted for 1.4% of all populations.

The remaining 98.6% of the populations showed virtually no change on average. However, this global average, included entire regions that are significantly improving, largely in temperate regions (which house richer nations with often stronger regulations), but also systems experiencing widespread declines such as the Indo-Pacific birds and mammals. This again illustrates that global averages obscure important variation.

How do we interpret our results in the context of the conservation of wildlife? It is good news that not everything is declining everywhere, and we should celebrate our victories. That many populations have held stable or increased since 1970 suggests conservation is making improvements in some places. However, improvements in one region (e.g., Europe), while laudable, do not negate the importance of losses in others (e.g., Asia) where more work is needed.

In addition to giving us reasons to hope, our analyses show we can and should do more. 17.5% of the worlds vertebrate systems showed evidence of widespread, systematic decline (our estimate suggests as many as 87% of populations in these systems could be strongly declining). Even within largely stable systems, roughly 15% of populations seem to be strongly declining. It is only in comparison to previous estimates of a 68% decline that these threats might seem small. Thus, we should celebrate our victories –more systems are broadly improving than declining– while recognizing that much important conservation work remains.